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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service

PROCEDURE FOR THE FUMIGATION OF DRY BEANS AND COWPEAS

ON THE PACKAGING LINE

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Stored-Product Insects Section

In spite of the care taken to prevent last-minute infestation of stocks of dry beans and cowpeas to be placed in retail packages, insects like the bean or cowpea weevils, or one of the common meal moths, often lay eggs on the commodity. These eggs hatch after the package is in trade channels, and infestation frequently becomes noticeable by the time the product is on the retail counter.

A method has been developed whereby a measured amount of liquid fumigant is added to the commodity just before the filled bag or carton is sealed.^{1/} Insects at any stage of development included in the package are killed by the fumigant. The process is described as follows.

EQUIPMENT

1. A dispenser is used which will automatically drop a measured amount of fumigant in each package as it enters the sealing unit. This may be purchased as a complete unit or built from readily available parts. It should consist of the following: A tank of noncorroding metal to hold the supply of fumigant, a valve with a controlling mechanism such as a solenoid, to automatically measure out the desired dosage, and a device to activate the valve such as a microswitch or a photoelectric cell. For careful measurement a timing device between the activating unit and the automatic valve may be useful. If there are fluctuations in the line voltage a voltage regulator is desirable. Readymade units are available from the following firms and there may be others that can be adapted to this purpose.

Coast Laboratories
1859 South Van Ness Avenue
Fresno, California

National Instrument Company
5005 Queensbury Avenue
Baltimore, Maryland

^{1/} Mayer, E. L., and Nelson, H. D. Fumigation of Dry Beans and Cowpeas on the Packaging Line. U. S. Agr. Mktg. Serv. AMS-4, 11 pp., illus. Jan. 1955.

A satisfactory unit, costing approximately \$160, has been assembled from parts as follows: (Comparable parts made by other manufacturers would be suitable.)

Supply tank - stainless steel, 3- or 4-gallon capacity, closed type with air valve.

Solenoid valve - General Electric CR 9507-CIB, Cat. No. 4980760 A-30.

Microswitch B2-2RL leaf-type (Microswitch, Freeport, Ill.)

Timer - Dispenser controller, Model 100 (Coast Laboratories, Fresno, Calif.)

Delivery tube - 6- to 10-inch piece of copper tubing with inside diameter greater than valve orifice.

A less expensive but also less accurate unit has been made in which the timer is eliminated. The length of the discharge period of the solenoid is regulated by the length of contact between the leaf of the microswitch and the package of commodity.

2. A 10-milliliter graduated glass cylinder is used to calibrate the dispenser by measuring the output.

3. A hood is used over the dispenser and sealing unit, equipped with a suction blower with a capacity of 500 or more cubic feet per minute; and a discharge duct leads to the outside of the building.

4. A halide detector is included so that the filling and storage areas can be periodically checked to be sure the ventilation is adequate to remove any fumes. This is available from any refrigeration supply company, where it is known as a leak detector.

INSTALLATION

1. Place the dispenser on the conveyor line just ahead of the sealing unit. Attach the automatic valve where convenient to permit as short a delivery tube as possible. Adjust the delivery tube so that it will be just high enough to clear the open lips of the filled package.

2. Attach the activating device (microswitch or photoelectric cell) to the fence along which the bags of commodity are moved prior to being sealed. It has been found desirable to activate the device with the bag to be treated, so that if no bag is present no fumigant

is released. Locate the device so that it activates the valve at the exact time to properly release the fumigant into the bag. In assemblies where the bag is at rest position, the device will be at the rest position. Where the fumigant is introduced while the container is moving, the device must be located ahead of the delivery tube (see figure 1).

3. Install hood over dispenser unit to carry away excess fumes (see figure 2).

4. Calibrate the discharge of the dispenser. Discharge 10 shots into the graduated cylinder and adjust the dispenser until the total amount discharged is exactly 10 times the desired dosage. The amount of discharge may be regulated by adjusting the control on the valve, or the period of activation, or both. If a timer is used, adjustments are easily made by varying the time interval. If a microswitch without a timer is used, the time interval can be varied by moving the leaf of the switch in or out so as to vary the period of contact with the bag.

PROCEDURE

The procedure is relatively simple once the equipment is properly installed. The routine procedure listed below should be followed at the beginning of each day's operation.

1. Fill supply tank.
2. Start suction blower in hood.
3. Calibrate dispenser.
4. Start packaging machine in operation.
5. Check to see that discharge tube of dispenser is properly located over the packages as they pass the dispenser.

RECOMMENDED DOSAGE RATES

The fumigants recommended for use and the appropriate dosage rate of each are as follows:

<u>Fumigant</u> <u>2/</u>	<u>Milliliters</u> <u>per 1-pound</u> <u>cellophane bag</u>	<u>Milliliters</u> <u>per 1-pound</u> <u>cardboard carton</u>
Ethylene dibromide - carbon tetrachloride (5-95)	0.3	2.0
Methyl bromide - carbon tetrachloride (10-90)	.3	2.0
Proprietary formula A (Ethylene dibromide, ethyl acetate, propylene oxide, methyl formate, methylene chloride, chloroform, isopropyl alcohol) <u>3/</u>	.2	1.0

PRECAUTIONS

Public Health authorities have established that concentrations above 25 to 50 p.p.m. of carbon tetrachloride in air are dangerous if workers are exposed over any considerable length of time. Ethylene dibromide and methyl bromide are hazardous at even lower levels. Health hazards from the vapors of fumigants, however, can be adequately taken care of by proper ventilation. The installation of a hood over the dispenser and sealing unit will remove fumes from that working area. If checks with a halide detector show accumulations of fumes in the warehouse area, fans or blowers should be installed to remove them. These gases are all heavier than air, so proper ventilation of the floor area in the warehouse is quite important.

Some fumigants are flammable, and the supplies of them should be stored where they will cause no hazard. To avoid risk, manufacturer's and insurance brokers' instructions should be followed.

2/ Mixture given in percent by volume.

3/ Manufactured and sold by Neal A. McLean Co., Inc., 470 Eighth St., San Francisco, Calif.

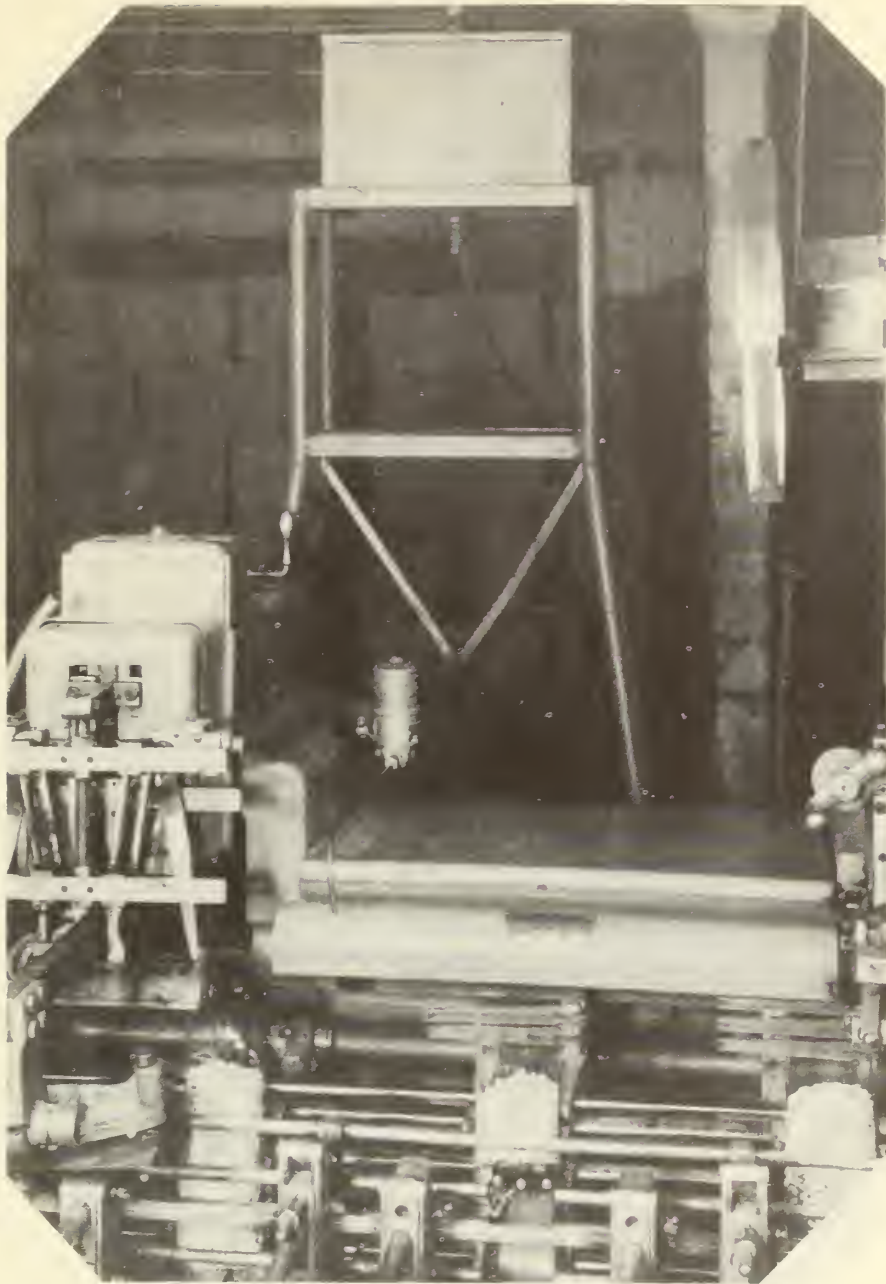


Figure 1.--Dispenser unit consisting of supply tank, solenoid valve and microswitch in place on a packaging machine. The microswitch can be seen directly in front of the center bag, and the dosage of fumigant will be delivered to that bag as it passes under the delivery tube. The supply tank is shown at the top, and the solenoid valve directly beneath it at the center of the picture. This dispenser delivers the dosage while the bag is on the move.

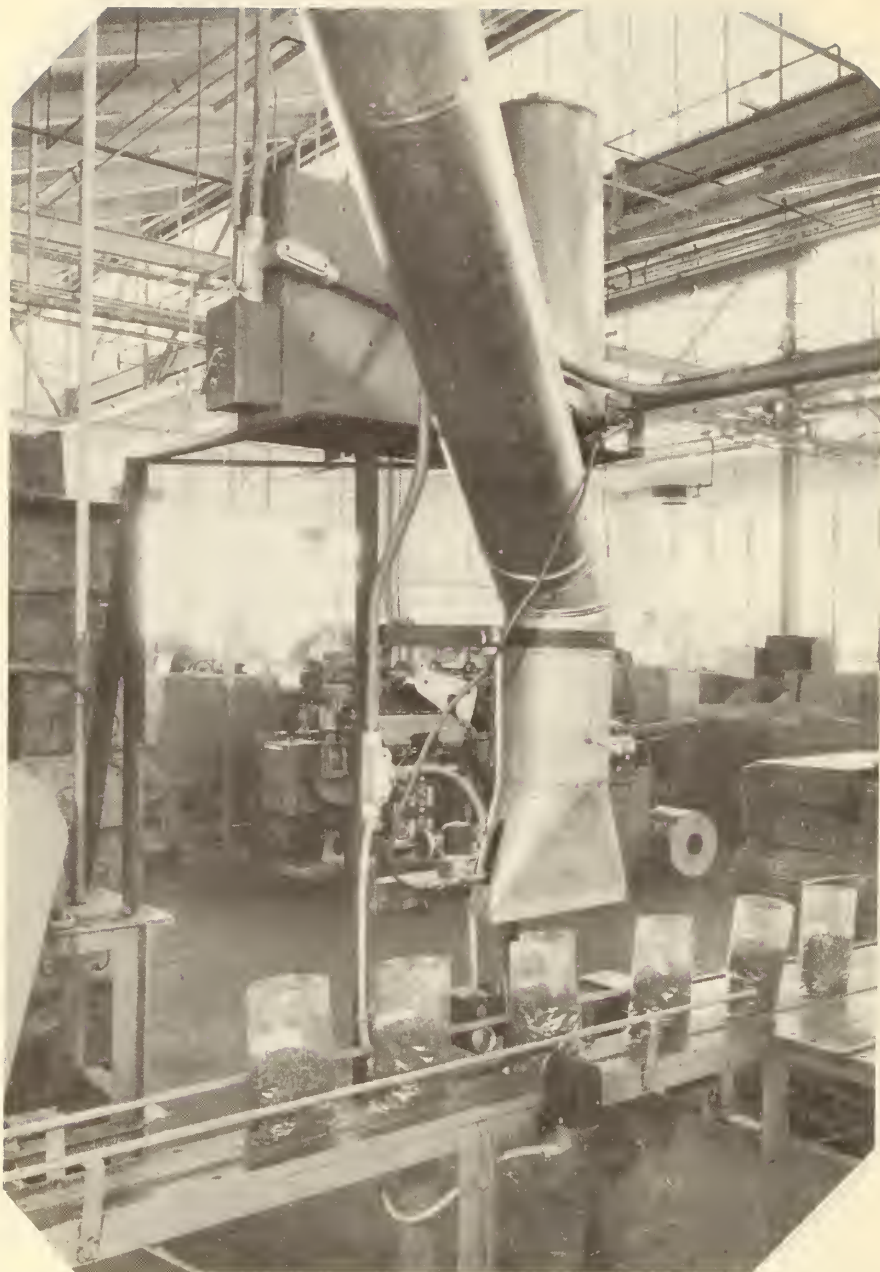


Figure 2.—Typical arrangement of hood over fumigant dispensing unit, in this instance set up to apply a fumigant to retail packages of dried fruit. It can be noted that the activating device in this unit is a photoelectric cell.

